

**Cost<sup>1</sup>:**

Signage (if desired): \$50 - \$150 plus installation

No additional cost if new line is installed in new paving or as part of repaving

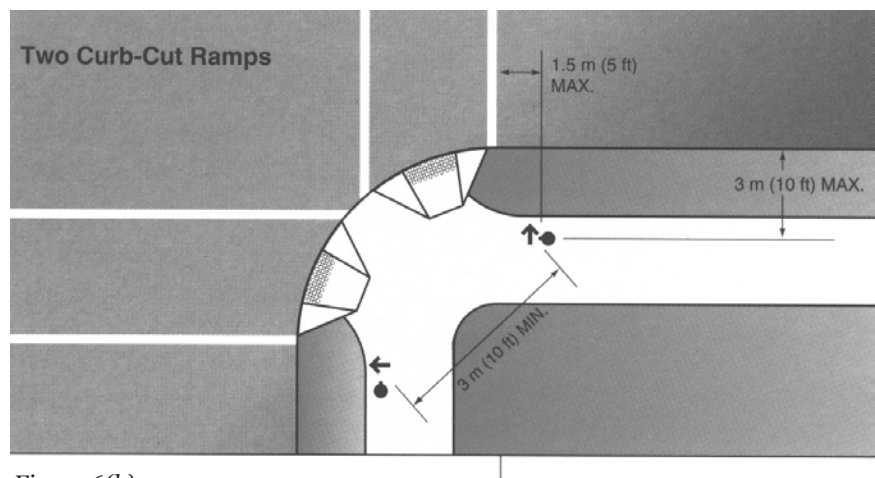


*Figure 6(j):  
Curb ramps shown have two separate  
ramps at the intersection<sup>1</sup>.*

**Curb Ramps**

Curb ramps are critical features that provide access between the sidewalk and roadway for wheelchair users, people using walkers, crutches, or handcars, people pushing bicycles or strollers, and pedestrians with mobility or other physical impairments. In accordance with the 1973 Federal Rehabilitation Act and to comply with the 1990 Federal ADA requirements, curb ramps must be installed at all intersections and mid-block locations where pedestrian crossings exist<sup>1</sup>. In addition, these federal regulations require that all new constructed or altered roadways include curb ramps. Although the federally prescribed maximum slope for a curb ramp is 1:12 or 8.33% and the side flares of the curb ramp must not exceed a maximum slope of 1:10 or 10.0%, it is recommended that much less steep slopes be used whenever possible.

It is also recommended that two separate curb ramps be provided at each intersection (Figure 6(i)). With only one large curb ramp serving the entire corner, there is not safe connectivity for the pedestrian. Dangerous conditions exist when the single, large



*Figure 6(k):  
Location of pedestrian push-button.<sup>3</sup>*

curb ramp inadvertently directs a pedestrian into the center of the intersection, or in front of an unsuspecting, turning vehicle.

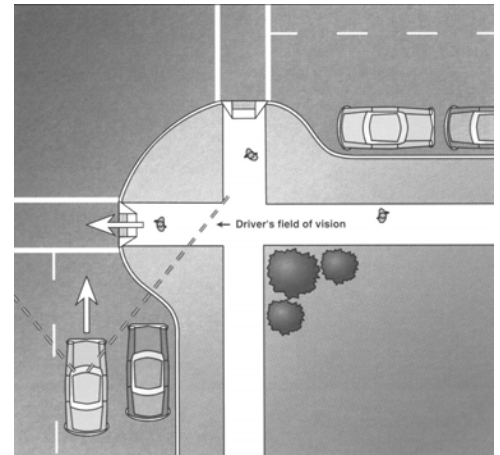
For additional information on curb ramps see *Accessible Rights-of-Way: A Design Guide*, by the U.S. Access Board and the Federal Highway Administration, and *Designing Sidewalks and Trails for Access*, Parts I and II, by the Federal Highway Administration. Visit: [www.access-board.gov](http://www.access-board.gov) for the Access board's right-of-way report<sup>1</sup>.

#### Guidelines<sup>2</sup>:

- Two separate curb ramps, one for each crosswalk, should be provided at corner of an intersection.
- Curb ramp should have a slope no greater than 1:12 (8.33%). Side flares should not exceed 1:10 (10%).

#### Cost<sup>1</sup>:

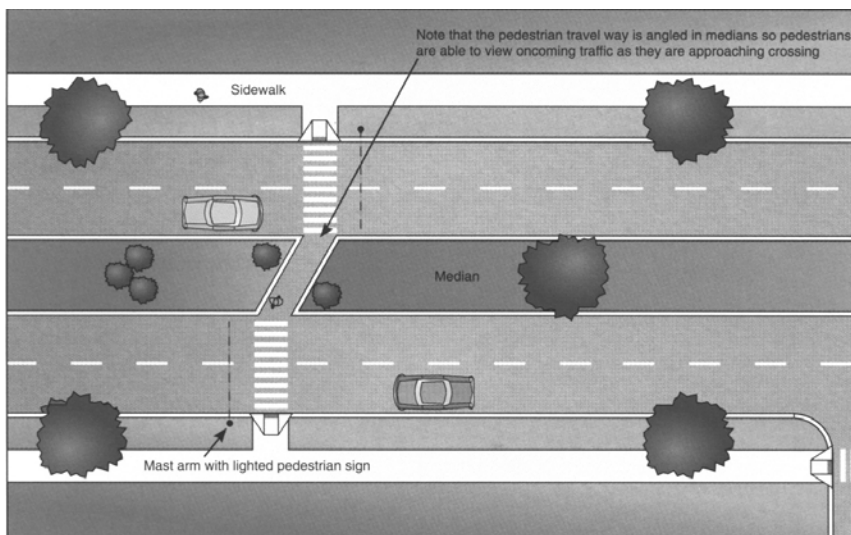
Curb ramp: \$800 - \$1,500 per ramp (new or retrofit)



*Figure 6(m):  
By reducing a pedestrian's crossing distance, less time is spent in the roadway, and pedestrian vehicle conflicts are reduced.<sup>3</sup>*

### Raised or Lowered Medians

Medians are barriers in the center portion of a street or roadway<sup>1</sup>. When used in conjunction with mid-block or intersection crossings, they can be used as a crossing island to provide a place



*Figure 1):  
A lowered median can be used to filter stormwater and provide a refuge for pedestrians crossing a roadway<sup>3</sup>.*

of refuge for pedestrians. They also provide opportunities for landscaping that in turn can help to slow traffic. A center turn lane can be converted into a raised or lowered median thus increasing motorist safety.

A continuous median can present several problems when used inappropriately. If all left-turn opportunities are removed, there runs a possibility for increased traffic speeds and unsafe U-turns at intersections. Additionally, the space occupied may be taking up room that could be used for bike lanes or other treatments discussed in this chapter. An alternative to the continuous median is to create a segmented median with left turn opportunities.

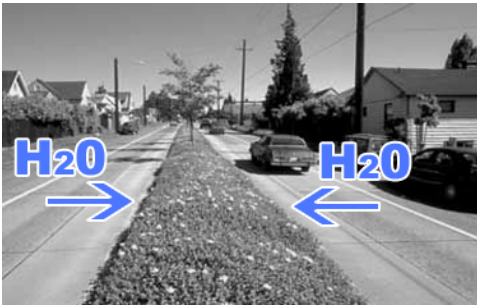


Figure 6(n):  
An attractive lowered median landscaped to appear raised<sup>1</sup>.

Raised or lowered medians are best suited for high-volume, high-speed roads, and they should provide ample cues for people with visual impairments to identify the boundary between the crossing island and the roadway.

#### Guidelines<sup>3,9</sup>:

- Median pedestrian refuge islands should be provided as a place of refuge for pedestrians crossing busy or wide roadways at either mid-block locations or intersections. They should be utilized on high speed and high volume roadways.
- Medians should incorporate trees and plantings to change the character of the street and reduce motor vehicle speed.
- Landscaping should not obstruct the visibility between motorists and pedestrians.
- Median crossings should provide ramps or cut-throughs for ease of accessibility for all pedestrians
- Median crossings should be at least 6 feet wide in order to accommodate more than one pedestrian, while a width of 8 feet (where feasible) should be provided for bicycles, wheelchairs, and groups of pedestrians
- Median crossings should possess a minimum of a 4 foot square level landing to provide a rest point for wheelchair users.
- Pedestrian pushbuttons should be located in the median of all signalized mid-block crossings, where the roadway width is in excess of 60 feet.

#### Cost<sup>1</sup>:

Raised or lowered: \$15,000 - \$30,000 per 100 feet.

### Bulb-outs

A bulb-out, or curb extension, is a place where the sidewalk extends into the parking lane of a street. Because these curb extensions physically narrow the roadway, a pedestrian's crossing distance and consequently the time spent in the street is reduced. They can be placed either at mid-block crossings or at intersections.

Sightlines and pedestrian visibility are reduced when motor vehicle parking encroaches too close to corners creating a dangerous situation for pedestrians. When placed at an intersection, bulb-outs preclude vehicle parking too close to a crosswalk. Also, bulb-outs at intersections can greatly reduce turning speed, especially if curb radii are set as tight as possible<sup>1</sup>. Finally, bulb-outs also reduce travel speeds when used in mid-block crossings because of the reduced street width.

Bulb-outs should only be used where there is an existing on-street parking lane and should never encroach into travel lanes, bike lanes, or shoulders<sup>1</sup>.

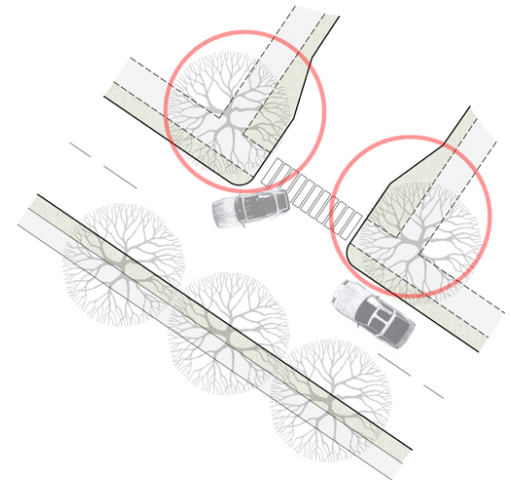


Figure 6(o):  
By reducing a pedestrian's crossing distance, less time is spent in the roadway, and pedestrian vehicle conflicts are reduced.

#### Guidelines<sup>10</sup>:

- Bulb-outs should be used on crosswalks in heavy pedestrian areas where parking may limit the driver's view of the pedestrian.
- Where used, sidewalk bulb-outs should extend into the street for the width of a parking lane (a minimum five feet) in order to provide for a shorter crossing width, increased pedestrian visibility, more space for pedestrian queuing, and a place for sidewalk amenities and planting.
- Curb extensions should be used on mid-block crossing where feasible.
- Curb extensions may be inappropriate for use on corners where frequent right turns are made by trucks or buses.

#### Cost<sup>1</sup>:

Bulb-outs/Curb extensions: \$2,000 - \$20,000

Cost can increase depending on the amount of infrastructure that may have to be relocated.



*Figure 6(p):  
Attempting to separate pedestrians from the street is often problematic. As shown here, given the opportunity, many choose to cross at street level<sup>1</sup>.*

### Pedestrian Overpass/Underpass

Pedestrian overpasses and underpasses efficiently allow for pedestrian movement across busy thoroughfares<sup>1</sup>. These types of facilities are problematic in many regards and should only be considered under suitable circumstances or where no other solution is possible. Perhaps the best argument for using them sparingly is that research proves pedestrians will avoid using such a facility if they perceive the ability to cross at grade as taking about the same amount of time<sup>1</sup>.

The other areas of contention arise with the high cost of construction. There are also ADA requirements for stairs, ramps, and elevators that in many cases once complied with result in an enormous structure that is visually disruptive and difficult to access.

Overpasses work best when existing topography allows for smooth transitions. Underpasses as well work best with favorable topography when they are open and accessible, and exhibit a sense of safety<sup>1</sup>. Each should only be considered with rail lines, high volume traffic areas such as freeways, and other high volume arteries<sup>1</sup>.

#### Guidelines<sup>10</sup>:

- Over and underpasses should be considered only for crossing arterials with greater than 20,000 vehicle trips per day and speeds 35 - 40 mph and over.
- Minimum widths for over and underpasses should follow the guidelines for sidewalk width.
- Underpasses should have a daytime illuminance minimum of 10 fc achievable through artificial and/or natural light provided through an open gap to sky between the two sets of highway lanes, and a night time level of 4 foot-candle.
- In underpasses, where vertical clearance allows, the pedestrian walkway should be separated from the roadway by more than a standard curb height.
- Consider acoustics measures within underpasses to reduce noise impacts to pedestrians and bicyclists.

#### Cost<sup>1</sup>:

Varies greatly from \$500,000 to \$4,000,000